Petrified Forest

National Park Service
U.S. Department of the Interior

Florissant Fossil Beds
National Monument

In the valley behind the visitor center, 34 million years ago, a tall forest grew. Some of the trees survived as fossils visible on the trails today. Read on to find out what kinds of trees lived here, how they petrified, what scientists have learned from them, and where you can see them.

Why are only stumps left?

Heavy rainfall or rapid snowmelt can sweep rock and ash from the slopes of volcanos into thick mudflows called lahars. In steep areas, lahars can rush downslope at up to 120 mi/hr (190 km/hr). The ancient Guffey volcano, no longer present, towered above Florissant in the Eocene. One lahar from the volcano flowed through the stream valleys 34 million years ago and smothered the Florissant forest under more than 16 ft (5 m) of debris. The volcanic mudflow killed the trees by preventing oxygen from reaching their roots. The lahar encased and protected the lower trunks, but the rest of the trees (including roots) decayed or broke off.

Colorful Petrified Wood

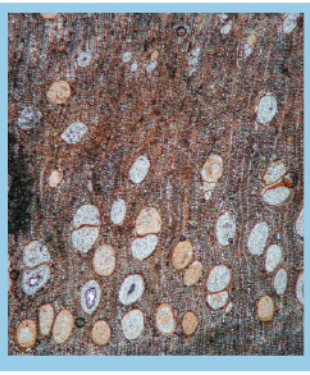
You can see many colors in the petrified stumps. Cream-colored fossil wood usually contains quartz. Dark brown or grey indicates organic material, often in opal. Iron minerals make other colors, including black and dull red.

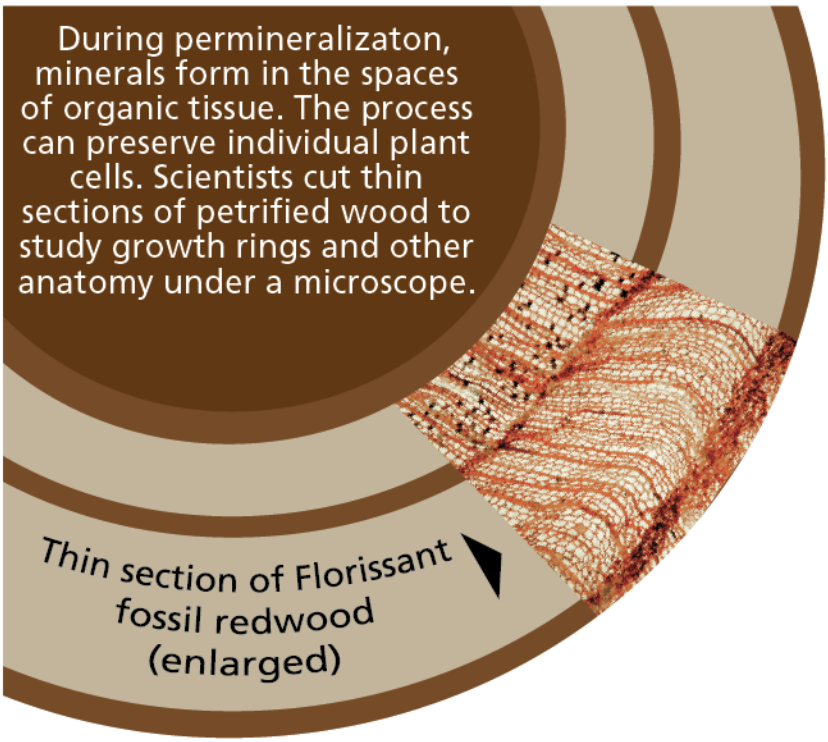
Are there more stumps underground?

Researchers have searched for undiscovered stumps at Florissant in several ways. Ground-penetrating radar, which measures reflections from electromagnetic pulses, has not been effective because the upper soil of the park is rich in clay. A recent study, using a magnetometer, shows promise for detecting stumps. The study found a noticeable difference in the local magnetic field above the silica-rich stumps compared to the surrounding, volcanic rock, which contains a magnetic mineral called magnetite.

How does a tree petrify?

When mineral-rich water penetrates wood, it deposits silica on the plant cells. As the wood decays and water continues to seep in, more silica minerals (opal, quartz, and a quartz with microscopic crystals called chalcedony) form inside the cells. Most of the silica in the stumps at Florissant probably came from volcanic rock and ash. Certain types of wood, like redwood trunks, are more durable than others, which may make them more likely to petrify. Experiments show that wood can petrify in tens to hundreds of years in ideal conditions, but it likely took much longer for the stumps at Florissant to turn into rock. Some plant tissue remains after wood petrifies, which helps preserve the tree structure in cellular detail like that seen in the fossil wood of *Koelreuteria* (golden rain tree) at right.





Do the stumps have growth rings?

Some of the petrified redwood stumps at Florissant show clear growth rings. The florissant fossil tree rings are wider than those of modern California redwoods, indicating a better growing season in the past. A technique called tree ring cross-dating matches the patterns of thin and thick rings among different trunks to see if the trees lived through any of the same drought or wet periods. Petrified Florissant trees have the same patterns, so it is likely that all the trees in the forest died at the same time. A single lahar probably covered the entire valley in a day.

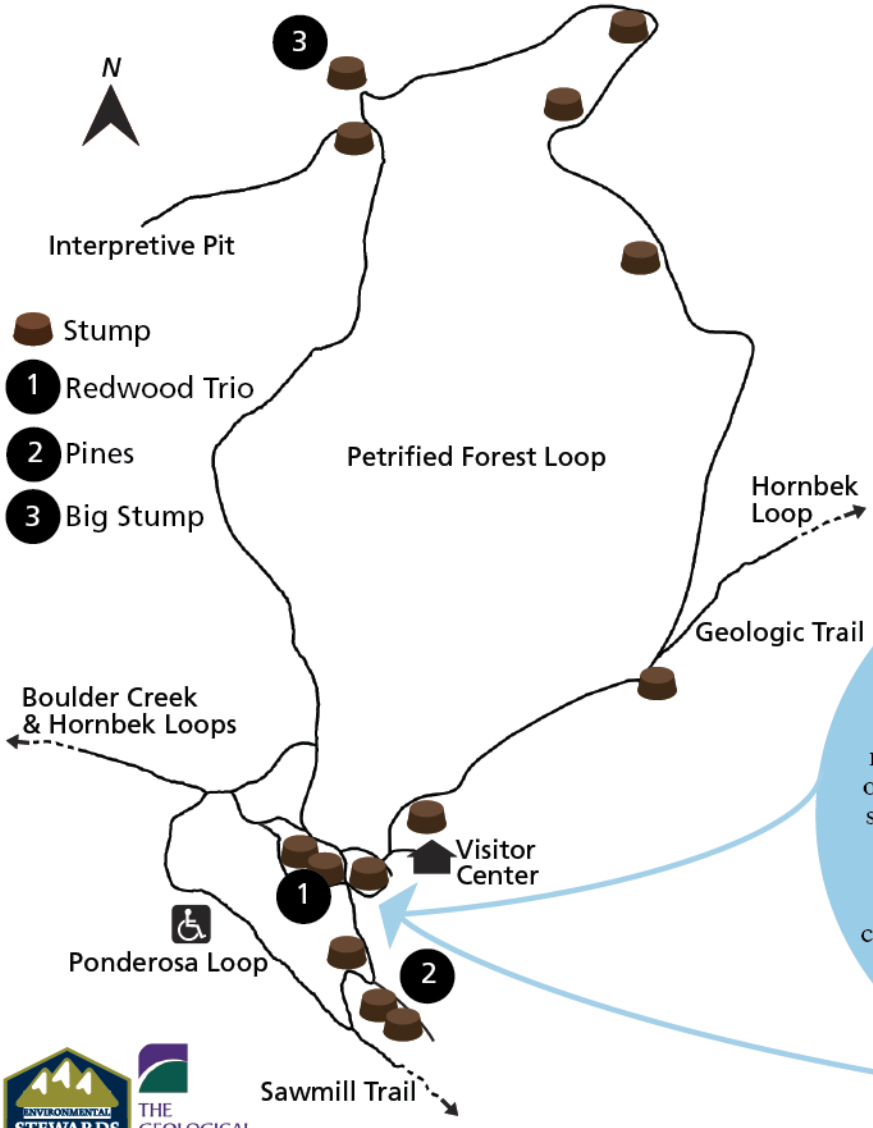
What kinds of trees lived here?

Most fossil stumps at Florissant are redwoods related to the coast redwoods now living in California and Oregon. Some of the petrified wood comes from hardwoods, including *Hovenia* (realted to Japanese raisin trees), *Koelreuteria* (golden rain tree), *Robinia* (locust), *Zelkova* (related to elms), and *Chadronoxylon*.

Where can I see petrified stumps?

The Ponderosa Pine Loop and Petrified Forest Loop trails pass more than a dozen petrified stumps (map at left). Some of the best stumps lie right behind the visitor center, however (site 1). On the Ponderosa Pine Loop trail, a modern forest surrounds the fossil one, and living pines grow directly on top of petrified stumps (site 2)! The Big Stump (site 3) on the Petrified Forest Loop trail has been completely excavated.

The petrified trees are the largest fossils at Florissant. Please help protect them by staying behind railings. Law prohibits disturbing or collecting fossils in the park.



Explosive Excavations

Early settlers knew of the stumps near Florissant, and tourists arrived with the railroad in 1887. Collectors removed dozens of exposed stumps by the turn of the century, sometimes by wagon loads. In the 1920s, two commercial sites excavated stumps on the land. One of these private operations used dynamite, which likely contributed to the cracks visible in the stumps under the shelters by the visitor center.